

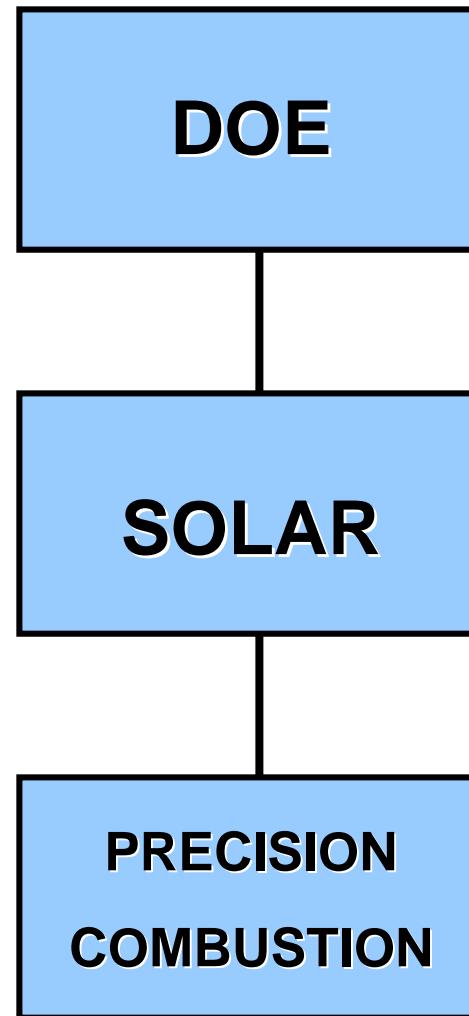
**Near-Zero NOx
Combustion Technology
for
ATS Mercury 50
Gas Turbine**

Contract DE-FC02-00CH11055

March 2002

- Program Overview
- Status and Results
- Plans

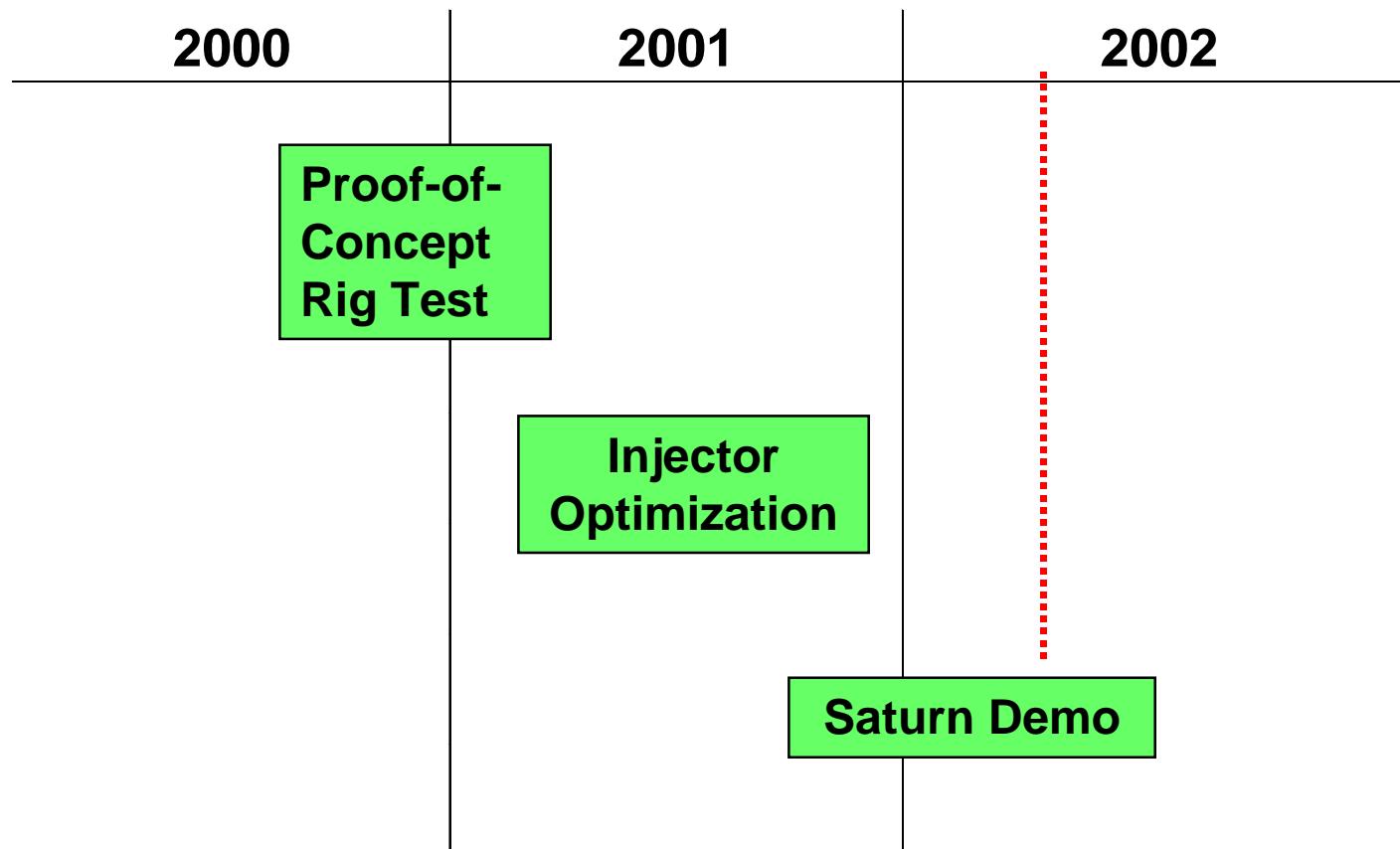
Program Structure



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Dr. Lance Smith

PROGRAM SCHEDULE



- Advance PCI's RCL™ catalytic combustion concept
 - mid-size industrial GTs
 - original plan: rig tests
 - expanded plan: rig tests and engine demo
- 18 month duration
- Solar/PCI cost-sharing
- DOE Manager: Steve Waslo

Overall Program Objectives

- RCL™ system tests in high pressure rig
 - Demonstrate NOx < 3 ppm, CO < 10 ppm
 - Document acceptable module temperatures
 - Assess turndown and pressure oscillations
- RCL™ system tests in Saturn engine test facility
 - Transients: operation of RCL™ combustor from engine start-up, to base-load, to shut-down
 - Demonstrate RCL™ robustness in engine environment
 - Demonstrate NOx < 3 ppm, CO < 10 ppm

- RCL™ system demonstration in Solar's Saturn engine test facility (1 MW)
 - Four reactor “cluster”
 - Assess transient performance
- Design and Fab 4 RCL™ Modules
 - Rig test 1 RCL™ Module at full and part load
 - Optimize Performance
 - Install and Run 4 RCL™ Modules in Saturn engine

SATURN TEST FACILITY

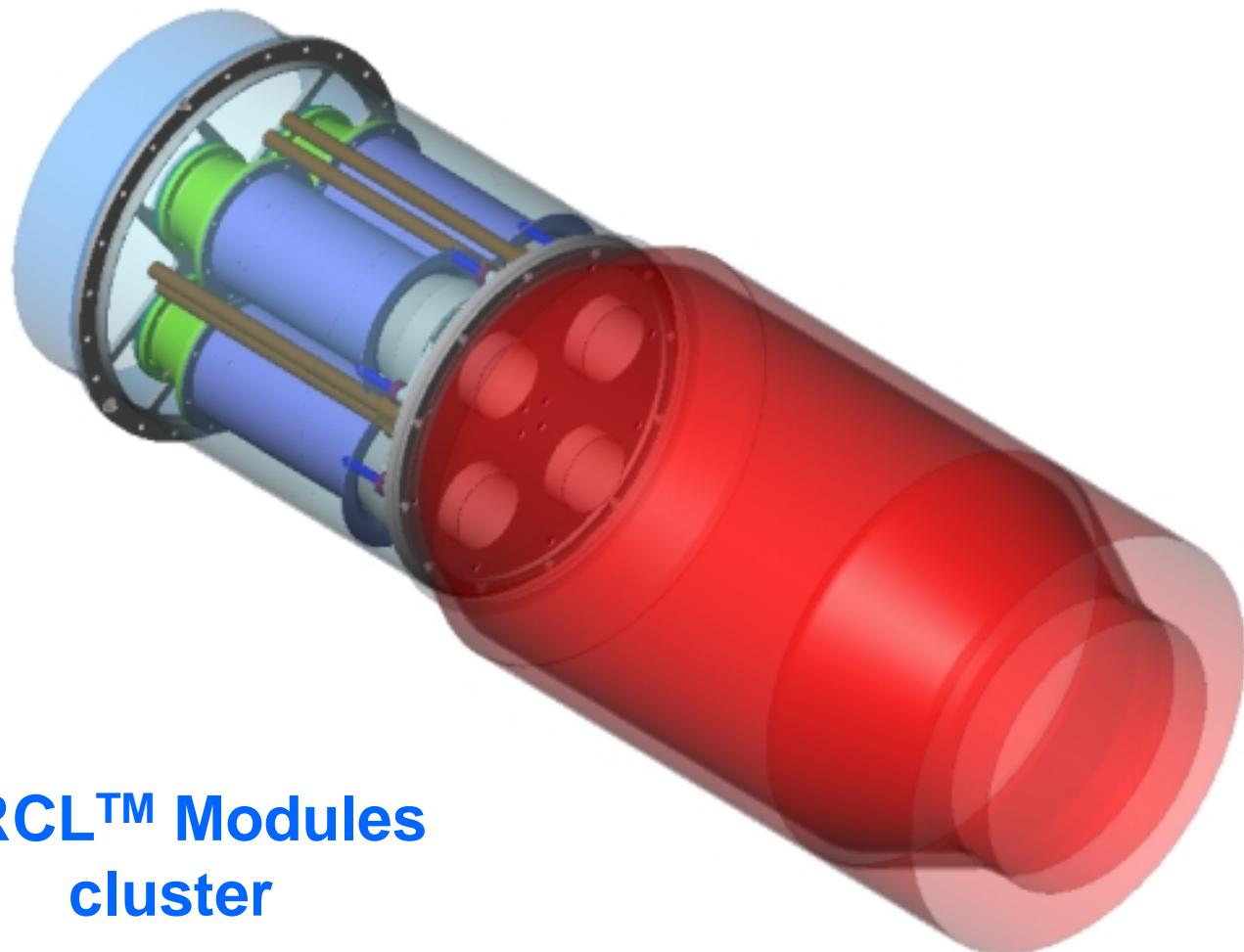


Saturn Catalytic Combustor



- Hardware delivery March 2002
- Saturn engine test April 2002

Saturn Combustor Assembly

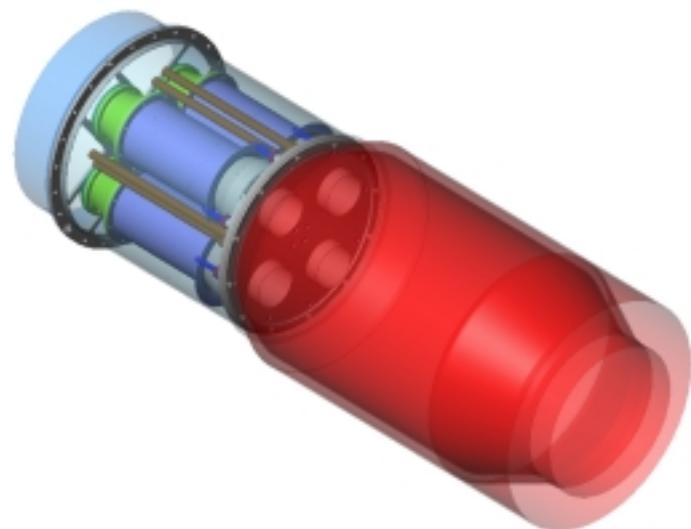


**4 RCL™ Modules
cluster**

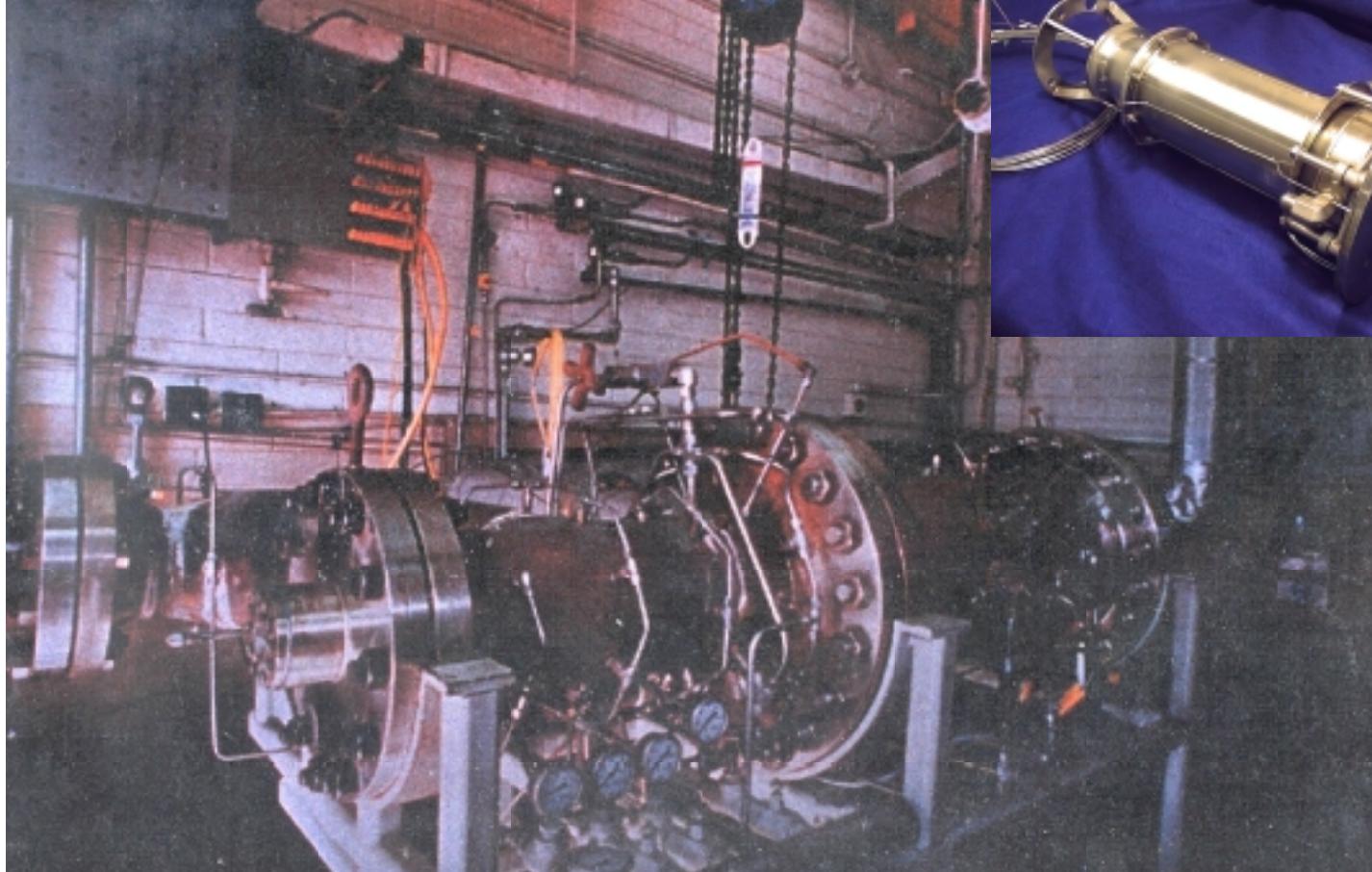
Solar Turbines

A Caterpillar Company

Overall Assembly



Single Module Test Facility



Test at T70 and Saturn conditions

- Initial engine test: Saturn
- Commercial focus: T70
- Perform single-module rig tests at :
 - Saturn-engine conditions (250 C inlet T)
 - T70-engine conditions (430 C inlet T)

RCL™ Performance @ Saturn & T70 – Single Injector Tests

<u>Parameter</u>	<u>T70 conditions</u>	<u>Saturn conditions</u>
Inlet Conditions	T = 425 C / 800 F P = 17 atm	T = 250 C / 480 F P = 6 atm
Emissions	NOx < 3 ppm CO < 10 ppm	NOx < 3 ppm CO < 10 ppm
Noise (CDPO)	< 0.35 psida (pk-pk) (< 0.15% pk-pk)	< 0.15 psida (pk-pk) (< 0.15% pk-pk)

- **RCL™ system concept designed for Saturn catalytic engine**
- **1 (of 4) RCL™ modules verified in Solar's single-injector high-pressure test rig**
- **Hardware fabrication completed -- assembly and shipment in March 2002**
- **Engine test targeted for April 2002**

- Current Program
 - Complete Saturn testing
- Future Work
 - Elevate module design to prototype engine status for T70
 - Fabricate complete set of reactor modules for annular combustor
 - Define/implement combustion system mods

Planned Activities (cont'd)

- Atmospheric annular combustor checkout
- Engine loop rig test
 - partial pressure for T70
- In-house engine test
- Field test
 - RCL™ performance
 - RCL™ durability



Test Facilities



Full Combustor Rig

Engine Loop Rig



Annular Combustors

DLE Liner

Conventional Liner

